16/10 '00 17:04 FAX +41 32 888 57 76 WSA NEUCHATEL CH 004

L118479

Human Toxicol. (1986), 5, 91–93

Cadmium Metabolism in Man

G. R. Kelman

Faculty of Medicine, Level 5, Clinical Sciences Building, Mater Misericordiae Hospital, Waratah, NSW 2298, Australia

The time course of the fall in blood cadmium concentrations after cessation of exposure has been measured in nine workmen exposed to cadmium. When the initial blood cadmium concentration was below 180 nmol/l (six subjects) it declined smoothly and roughly exponentially, with a mean half-life of 20.4 months and a final asymptote of 70 nmol/l; in the remaining three subjects (initial blood cadmium concentration above 180 nmol/l) the decay was less regular and more prolonged (mean half-life 31.4 months, final asymptote 92 nmol/l). The significance of these results in relation to occupational cadmium exposure is discussed.

Introduction

There are marked differences of opinion about the rate of fall of blood cadmium concentrations in workers exposed to cadmium after cessation of exposure: Piscator found a biological half-time of 'about half a year' (data quoted by Friberg *et al.*, 1974), Kjellstrom (1977) found a half-time of 80 days and Welinder *et al.* (1977) half-times which ranged from 24 to 146 days. The results presented in the present paper provide further information on this subject.

Methods

The measurements were made on nine workmen whose chief employment was the hard-soldering of refrigerator heat-exchanges. At the start of the investigation (1976) their mean age was 50.8 years (SD 8.7 years); their mean duration of employment was 23.7 years (SD 9.1 years). Before 1976 the solder contained some 25% cadmium; but in 1976 it was replaced by a cadmium-free solder because of the health hazard posed by the generation of cadmium oxide fume during soldering.

Blood cadmium concentrations were measured on venous blood samples obtained in 1976 and at approximately yearly intervals thereafter until 1984. Urinary cadmium concentrations were measured in 1976, 1977 and 1980. Urinary β_2-microglobulin concentrations were measured in 1980. The analyses were carried out at the Health and Safety Executives' Cricklewood laboratory by using atomic absorption spectrophotometry. The co-efficient of variation of repeated measurements of blood cadmium on the same sample is around 3% (D. Gompertz, personal communication). The measurements were made as part of the routine biological monitoring of the workforce and all individual results were fed back to the worker concerned.

Results

The subjects' ages, durations of employment, initial (whole) blood cadmium concentrations, urine analyses and smoking history are presented in Table 1. The six subjects who had initial blood cadmium concentrations below 180 nmol/l showed a remarkable uniformity in the time course of their blood cadmium decay after cessation of exposure (Figure 1). Least-square fitting of a single exponential to the pooled results gave a biological half-time of 20.4 months, with an asymptote of 70 nmol/l.

The three subjects who had initial blood cadmium concentrations of 180 nmol/l or above showed less uniformity (Figure 2). Exponential curve filling gave a half-time and asymptote of 31.4 months and 92 nmol/l respectively; but the variability of the individual decay curves is such that these parameters must be regarded as approximations only.

One worker, subject no. 7, had a markedly increased urinary β_2-microglobulin concentration and a urinary cadmium concentration which was raised out of proportion to his blood cadmium concentrations (see the Discussion section).

© The Macmillan Press Ltd 1986

PM3001192652

Source: https://www.industrydocuments.ucsf.edu/docs/jywk0001